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EXAMINER	
WANG, XIAOBEI	

ART UNIT	PAPER NUMBER
4181	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/582,707	TWITCHEN ET AL.	
	Examiner	Art Unit	
	XIAOBEI WANG	4181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-74* is/are pending in the application.

4a) Of the above claim(s) *54-74* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/12/2006, 1/9/2008, 1/5/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restriction

Applicant filed a response to restriction requirement 1/9/2009 electing to prosecute the claims of Group 2, with traverse. Examiner agrees with applicant regarding the claims of Group 1 in that Group 1 and Group 2 should be examined together as they have unity of invention.

However, regarding Groups 3 and 4, the apparatus of Group 3 is directed towards an apparatus that comprises a body arranged for receiving a CVD single crystal diamond, and a source of light or radiation for directing light or radiation at the CVD single crystal diamond. This apparatus is not for carrying out the method of Group 1, nor is it the product of Group 2, and thus lacks a common technical feature with the inventions of Group 1 and Group 2; therefore it is not considered to be related to the other groups under 37 C.F.R. 1.475(b). Furthermore, the apparatus lacks unity a priori because it does not share any common technical features with the inventions of Group 1 or Group 2. Intended use is not read as a limitation of the apparatus claim. Group 4, directed towards the use of the apparatus of Group 3, must also lack unity. Group 4 is directed towards the use of the apparatus of Group 3, and therefore also does not lack unity with the inventions of Group 1 or 2.

Applicant has not shown why the apparatus of Group 3 does not lack unity with Groups 1 or 2. Thus, this restriction is deemed proper and made FINAL.

Claim Objections

Claim 6 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the

claim(s) in independent form. Claim 6 recites a photoluminescence peak (533) at a wavelength that is not included in the claim it is dependent upon.

Status Report

Claims 1-53 are pending and presented for examination. Claims 54-74 are withdrawn as being directed to a nonelected invention.

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-7, 11, 21-26, 29-35, 40-49, 51-52 are rejected under 35 U.S.C. 102(e) as being anticipated by Linares et al (WO 03/014427). Reference appears in applicant's IDS and thus is not being provided with this office action.

Regarding claims 1 and 29, Linares teaches a method of growing a single crystal diamond by using a diamond substrate with a certain orientation in a CVD process (pg 32, lines 31-32), introducing a source gas to grow a single crystal diamond having a certain orientation, wherein the incorporation of a boron dopant is controlled (pg 33, lines 8-30). Linares discloses that the doping of the diamond structure by dopant atoms increases the average distance between carbon atoms in the diamond because the dopant atoms are larger than carbon atoms (pg 13, lines 23-31). Thus, these marks made by the dopant would only be viewable under special viewing conditions, and can be considered fingerprints.

Regarding claim 2, Linares discloses that the addition of boron in diamond results in optical absorption in the near infrared. Thus, the mark caused by boron impurities would be rendered detectable when the diamond material is exposed to a certain radiation.

Regarding claims 3 and 4, Linares teaches a process of incorporating boron impurities into a single crystal diamond, wherein the source gas has been enriched with diborane (pg 35, lines 17-20). This would inherently cause the boron dopant to be provided in one or more layers or regions of the diamond material during synthesis, as the dopant is introduced in a controlled manner continuously.

Regarding claim 7, Linares discloses that the single crystal diamond contains boron (pg 33, lines 8-30). Boron doping is known to impart a blue coloration to diamond crystal, as disclosed in Linares (pg 16, lines 9-12). Because the blue wavelength lies within 400 to 500 nm, it is inherent that a diamond crystal with boron doping would phosphoresce within the range of the instant claim.

Regarding claim 11, Linares discloses that the boron content is higher than the nitrogen content (pg 27, lines 22-29).

Regarding claim 21-23, doping the diamond crystal would inherently produce a defect center because the dopant atoms (boron or nitrogen) are larger than carbon atoms (pg 13, lines 23-30), and that these defects are not found in natural diamond because the defects present in the CVD diamonds are doped in a controlled manner, which is different from that of a naturally occurring diamond.

Regarding claims 24-25, modifying the diamond would inherently cause the optical properties of the diamond to change, thereby altering the measurable optical properties, allowing changes to be measured and thereby allowing identification of modification.

Regarding claim 26, Linares discloses that the doped diamond crystal have a unique combination of properties as a result of their impurities (pg 12, lines 1-14). Thus, it would be

inherent that the resulting fingerprint can be used to identify the synthetic nature of the material it is present in.

Regarding claim 30, Linares teaches a single crystal diamond by using a substrate with a certain orientation in a CVD process (pg 32, lines 31-32), introducing a source gas to grow a single crystal diamond having a certain orientation, wherein the incorporation of a boron dopant is controlled (pg 33, lines 8-30). Linares discloses that the doping of the diamond structure by dopant atoms increases the average distance between carbon atoms in the diamond because the dopant atoms are larger than carbon atoms (pg 13, lines 23-31). Thus, these marks made by the dopant would only be viewable under special viewing conditions, and can be considered fingerprints.

Regarding claim 31, Linares discloses that the CVD single crystal diamond may be used as a gemstone (pg 15, lines 23-27).

Regarding claims 32-34, doping the diamond crystal would inherently produce a defect center because the dopant atoms (boron or nitrogen) are larger than carbon atoms (pg 13, lines 23-30), and that these defects are not found in natural diamond because the defects present in the CVD diamonds are doped in a controlled manner, which is different from that of a naturally occurring diamond.

Regarding claim 35, it is readily apparent that the impurities as fingerprint form defect centers because they are larger than carbon atoms. Furthermore, it is also readily apparent to observe optical properties through the table of the gemstone, as doing so minimizes refraction.

Regarding claim 40, Linares discloses a CVD single crystal diamond wherein there are a multitude of doped layers (pg 39, lines 20-23). It is readily apparent to one skilled in the art that

a gemstone cut from this diamond would have layers approximately parallel with the table of the gemstone, since the top layer would already be flat and therefore be the basis for the gemstone table.

Regarding claims 41-43, Linares discloses that the CVD single crystal diamond doped with boron may be used as a surgical blade or other cutting tool (pg 16, lines 3-6).

Regarding claims 44-47, Linares discloses a CVD single crystal diamond doped with boron that has layer thickness of 250 μm (pg 40, lines 18-24).

Regarding claims 48-49, Linares discloses a CVD single crystal diamond doped with nitrogen that has layer thickness of at least 20 μm, preferably at least 50 μm (pg 25, lines 11-27).

Regarding claim 51, Linares discloses that the CVD single crystal diamond may contain layers of varying impurity levels. This would inherently possess properties of having discrete layers under suitable illumination conditions because varying levels of impurities would alter the illumination patterns.

Regarding claim 52, Linares discloses that the CVD single crystal diamond may contain a layer free of defects while other layers have defects (pg 12, lines 15-22).

Claims 5-6, 12, 50 are rejected under 35 U.S.C. 102(e) as being anticipated by Linares et al (WO 03/014427), as evidenced by Vlasov (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* phys. Stat. sol 181, 83, 2000). Both references appear in applicant's IDS and thus are not being provided with this office action.

Regarding claims 5-6, Linares recognizes that nitrogen doping may be used for similar purposes as boron doping (pg 14, lines 20-30). If nitrogen is used as a dopant in the single crystal diamond structure, the single crystal diamond would inherently show photoluminescence

peaks at 533 nm, 575 nm or 638 nm as evidenced by Vlasov et al (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* pg 85, Fig. 1).

Regarding claim 12, Linares discloses that the single diamond crystal may contain boron and nitrogen content (pg 22, lines 10-18). Boron is known to impart a blue coloration to diamond crystal, as disclosed in Linares (pg 16, lines 9-12). Because the blue wavelength lies within 400 to 500 nm, it is inherent that a diamond crystal with boron doping would phosphoresce within the range of the instant claim. Additionally, if nitrogen is used as a dopant in the single crystal diamond structure, the single crystal diamond would inherently show photoluminescence peaks at 533 nm, 575 nm or 638 nm as evidenced by Vlasov et al (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* pg 85, Fig. 1).

Regarding claim 50, Linares discloses that nitrogen doping may be used for similar purposes as boron doping (pg 14, lines 20-30). If nitrogen is used as a dopant in the single crystal diamond structure, the single crystal diamond would inherently show photoluminescence peaks at 575 nm and 638 nm as evidenced by Vlasov et al (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* pg 85, Fig. 1). These wavelengths are associated with orange colorations. Additionally, boron doping is known to impart a blue coloration to diamond crystal, as disclosed in Linares (pg 16, lines 9-12).

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Scarsbrook et al (US Patent 7,160,617), as evidenced by Linares et al (WO 03/014427).

Regarding claim 1, Scarsbrook teaches a method of growing a single crystal diamond by using a diamond substrate with a certain orientation in a CVD process (column 4, lines 55-67),

introducing a source gas to grow a single crystal diamond having a certain orientation, wherein the incorporation of the dopant is controlled (column 4, lines 55-61). Scarsbrook discloses that the doping of the diamond structure by dopant atoms results in luminescent features (column 3, lines 42-50). Thus, these marks made by the dopant would only be viewable under special viewing conditions, and can be considered fingerprints.

Claim 7 is rejected under 35 U.S.C. 102(e) as being anticipated by Scarsbrook et al (US Patent 7,160,617), as evidenced by Linares et al (WO 03/014427).

Regarding claim 7, Scarsbrook discloses that the single crystal diamond contains boron (column 3, lines 5-10). Boron doping is known to impart a blue coloration to diamond crystal, as evidenced by Linares (pg 16, lines 9-12). Because the blue wavelength lies within 400 to 500 nm, it is inherent that a diamond crystal with boron doping would phosphoresce within the range of the instant claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427).

Regarding claims 8-9, Linares discloses a boron concentration in the single crystal diamond between 0.03 ppm and 3,000 ppm. The instant claim recites an overlapping range, which is a prima facie case of obviousness (See MPEP 2144.05). It would have been obvious, at

the time of invention, for one skilled in the art to select a concentration within the range prescribed by Linares.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Scarsbrook et al (US Patent 7,160,617).

Regarding claim 10, Scarsbrook does not teach nitrogen and boron concentrations within a factor of 10 in a CVD single crystal diamond, but does teach boron and nitrogen doping in a CVD single crystal diamond wherein the nitrogen concentration is no greater than 1/5, and no less than 1/50 of the boron concentration. One of ordinary skill in the art would have been motivated at the time of invention to have because such a concentration relationship overlaps with the concentration relationship of the prior art (see MPEP 2131.03 II).

Claims 36-38 rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427), further in view of Gilbertson (US Patent 6,665,058).

Regarding claim 36, Linares does not disclose a gemstone having a solid geometrical shape or an unfilled geometrical shape, with an axial symmetry perpendicular to the table of the gemstone.

Gilbertson discloses a method of determining the symmetry for gemstones having the qualities of the instant claim (abstract).

It would have been obvious at the time of invention to one of ordinary skill in the art to apply the teachings of Gilbertson to Linares in order to make a gemstone having a solid geometrical shape with axial symmetry perpendicular to the table of the gemstone because the lack of such features decreases the brilliance of the gemstone as well as its value (Gilbertson, column 4, lines 5-15).

Regarding claim 37, Gilbertson teaches a gemstone that has a generally round shape (see Fig 5-8). This generally round shape lends to the symmetry of the gemstone. Any feature observable through the table of the gemstone would constitute a spot.

Regarding claim 38, the gemstones of Gilbertson (Fig. 5-8) have round brilliant forms (columns 3-4, lines 33-4).

Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427), in view of Falabella (US Patent 5,474,816) and Fernandes et al ("Porous silicon capping by CVD diamond", *Vacuum*, Vol 52, pg 215-218).

Regarding claims 13 and 14, Linares does not disclose a layer or region that emits 737 nm radiation. Falabella teaches a diamond material containing silicon dopants (column 3, lines 23-48). According to Fernandes, silicon has photoluminescence at 737nm (pg 216, Fig 2).

One of ordinary skill in the art would have been motivated to use silicon as a dopant in a CVD single crystal diamond, as taught by Falabella, in the process taught by Linares because it reduces the stress levels present in the diamond (column 3, lines 23-48).

Regarding claim 15 and 16, neither Linares nor Falabella disclose the concentration of silicon added as a dopant in the single crystal diamond. Linares does disclose that the amount of impurity present affects the crystal lattice of the diamond structure (pg 13, lines 25-28). Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to optimize the concentration of the dopant present in the diamond to arrive at a dopant concentration that would not adversely affect the diamond structure (See MPEP 2144.05 II).

Claims 17-18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427), in view of Vlasov et al (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* phys. Stat. sol 181, 83, 2000).

Regarding claim 17, Linares discloses that single diamond crystals containing impurities such as boron have optical absorption coefficients, but does not teach their observance with the human eye using filters and lenses.

Vlasov teaches measuring the luminescence with a spectrometer (pg. 84), which inherently have lenses and filters incorporated within them. This luminescence would be observed with the human eye if desired, because the luminescence is within the visible wavelengths (pg 85).

It would have been obvious to one of ordinary skill in the art at the time of invention to use the method of Vlasov to determine the level of impurities present in the diamond crystal made in Linares because the process of Vlasov can be used to determine the amount and type of dopants present in the crystal (Vlasov, pg 84).

Regarding claim 18, Vlasov measures the intensity of the photoluminescence emitted by the dopants in the crystal (pg 85, Fig 1).

Regarding claim 20, Vlasov shows an optical image capture that is produced from a spectrophotometer, which inherently containts lenses and filters (pg 85, Fig 1).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427) in view of Vlasov et al (*Relative Abundance of Single and Vacancy-Bonded Substitutional Nitrogen in CVD Diamond,* phys. Stat. sol 181, 83, 2000), as applied to claim

18 above, further in view of Falabella (US Patent 5,474,816) and Fernandes et al ("Porous silicon capping by CVD diamond", *Vacuum*, Vol 52, pg 215-218).

Regarding claim 19, Linares in view of Vlasov do not teach detecting 737 nm radiation. Falabella and Fernandes teach silicon doping of diamonds (Falabella, column 3, lines 23-48; Fernandes, pg 216, Fig 2), which would inherently give off 737 nm radiation (Fernandes, pg 216, Fig 2).

Thus, one of ordinary skill in the art at the time of invention would be motivated to detect 737 nm radiation using the radiation detection method of Vlasov in the process taught by Linares modified by Falabella, because if silicon impurities were present in the diamond, then one would want to detect their presence.

Claims 27-28, 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427), in view of Gresser (US Patent 4,392,476).

Regarding claims 27-28, Linares does not teach the impurity as a fingerprint being used to identify the manufacturer or in the manner of a trademark.

Gresser teaches a method of placing identifying indicia on the surface of gemstones, such as trademark symbols or names (column 2, lines 13-23).

Thus, it would have been obvious at the time of invention to one of ordinary skill in the art to use the impurity fingerprint of Linares to identify the manufacturer or in the manner of a trademark, in order to categorize various characteristics of the diamond for valuation purposes as described by Gresser (Gresser, column 1, lines 10-17).

Regarding claim 53, the process of Linares in view of Gresser necessarily produce a gemstone product containing a fingerprint used in the manner of a trademark.

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al (WO 03/014427), as applied to claim 35 above, further in view of Buchner (US Patent 5,524,458).

Regarding claim 39, Linares does not teach a rectangular shaped gemstone.

Buchner teaches gemstones that have rectangular shapes (see Fig 2, items 4, 8), as described in the specification (column 8, lines 8-13).

It would have been obvious to one of ordinary skill at the time of invention to make a gemstone with a rectangular shape as taught by Buchner, as it is clear that there is demand for gemstones of such shapes, from the product made by the process taught by Linares.

Because of the way in which the diamond is made in the process of Linares, the observable feature would be in the shape of a square because the doping is done by layer (pg 14, lines 20-30), and so the features would take the shape of the cut gemstone.

Conclusion

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to XIAOBEI WANG whose telephone number is (571)270-5764. The examiner can normally be reached on Monday - Friday, 8:00am - 5:00 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Vickie can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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